

CLAIMS

1. A radio comprising:

a transmit antenna tunable to a transmit frequency; and
a receive antenna distinct from the transmit antenna and tunable to a
receive frequency, the receive frequency being a different
independent frequency from the transmit frequency.

2. The radio of claim 1 further comprising:

an antenna control unit coupled with the transmit antenna and the receive
antenna and configured to control operation of the transmit antenna
and the receive antenna including tuning of at least one of the
transmit antenna and the receive antenna.

3. The radio of claim 2 wherein the antenna control unit controls
tuning of the receive antenna to a receive frequency and tuning of the transmit
antenna to a transmit frequency which is different from the receive frequency..

4. The radio of claim 2 further comprising:

a low noise amplifier coupled with the receive antenna; and
a power amplifier coupled with the transmit antenna, the antenna control
unit configured to match impedance between the receive antenna
and the low noise amplifier and to match impedance between the
power amplifier and the transmit antenna.

5. The radio of claim 2 further comprising:

a controller; and
a control bus communicating data between the controller and the antenna
control unit.

6. The radio of claim 2 wherein the receive antenna comprises a pair of planar inverted F (PIFA) antennas.

7. The radio of claim 2 wherein the transmit antenna comprises a planar inverted F (PIFA) antenna.

8. The radio of claim 2 further comprising:
a receive filter coupled with the receive antenna and tunable in response to
a control signal from the antenna control unit; and
a transmit filter coupled with the transmit antenna and tunable in response
to a control signal from the antenna control unit.

9. The radio of claim 2 comprising a portable radiotelephone.

10. The radio of claim 2 comprising a base station radio in a mobile radio system.

~~11.~~ A method for operating radio, the method comprising:
tuning a receive antenna of the radio to a receive frequency;
tuning a transmit antenna of the radio to a transmit frequency different
from the receive frequency; and
selectively transmitting and receiving signals at the radio.

~~12.~~ A wireless communication device comprising:
a transmit circuit;
a receive circuit; and
a programmable radio frequency (RF) front end electrically coupled with
the transmit circuit and the receive circuit and including
first and second antennas and first and second filters associated with
the first and second antennas, respectively, and

an antenna control unit responsive to control signals to control operational characteristics of the first and second antennas.

5 13. The wireless communication device of claim 12 wherein the first and second antennas each comprise a planar inverted F antenna tuned to operate at different frequencies.

10 14. The wireless communication device of claim 13 wherein the first and second antennas each comprise a tunable antenna including voltage variable capacitance elements responsive to tuning control signals from the antenna control unit for tuning the respective antenna.

15 15. A method for operating a wireless communication device, the method comprising:
 identifying an air interface standard for wireless communication;
 accessing configuration data associated with the identified air interface
 standard for controlling the wireless communication device; and
 responsive to the configuration data, configuring the wireless
 communication device for communication according to the
 identified air interface standard.
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25 16. The method of claim 15 wherein identifying the air interface standard comprises:
 at the wireless communication device, receiving radio signals defining the
 air interface standard.

 17. The method of claim 16 further comprising:
 responsive to the radio signals, retrieving data from a storage device of the
 wireless communication device as the configuration data; and

after configuring the wireless communication device, initiating communication with a remote radio according to the air interface standard.

5 18. The method of claim 16 further comprising:
detecting data in the radio signals as the configuration data; and
after configuring the wireless communication device, initiating
communication with a remote radio according to the air interface
standard.

10 19. The method of claim 15 wherein accessing configuration data
comprises receiving the configuration data over a wireless link.

15 20. The method of claim 15 wherein accessing configuration data
comprises retrieving the configuration data from a storage location of the wireless
communication device.

20 21. The method of claim 15 wherein accessing configuration data
comprises producing the data in response to air interface standard identification
information received at the wireless communication device.

25 22. The method of claim 15 wherein configuring the wireless
communication device comprises:

tuning at least one of a first antenna and a second antenna to a
communication frequency associated with the air interface standard.

30 23. The method of claim 22 wherein configuring the wireless
communication device further comprises:

providing a tuning offset signal to a transmit antenna to optimize signal
reception at a remote radio.

24. The method of claim 22 wherein configuring the wireless communication device further comprises:

providing a tuning offset signal to retune the at least one of a first antenna and a second antenna in response to a detuning condition.

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25. The method of claim 24 further comprising:

receiving a signal from a remote radio; and

in response to the signal, retuning a transmit antenna of the at least one of a first antenna and a second antenna.

26. The method of claim 22 wherein configuring the wireless communication device comprises:

tuning a tunable receive antenna and a tunable transmit antenna of the wireless communication device to the communication frequency.

27. The method of claim 26 wherein configuring the wireless communication device further comprises:

matching impedance of a low noise amplifier of the wireless communication device with impedance of the tunable receive antenna; and

matching impedance of a power amplifier of the wireless communication device with impedance of the tunable transmit antenna.

28. The method of claim 22 wherein configuring the wireless communication device further comprises:

tuning at least one of a first filter and a second filter to the communication frequency.

~~29.~~ A radio device comprising:

two or more antennas, each antenna being independently tunable to an operating frequency in response to tuning control signals;

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radio control means for identifying one or more current operating frequencies for the radio device; and
antenna control means responsive to the radio control means for providing the tuning control signals for tuning the two or more antennas to the one or more current operating frequencies.

30. The radio device of claim 29 further comprising:
filtering means coupled with the two antennas for filtering signals at the one or more current operating frequencies.

31. A radio communication system comprising:
a portable radio including a tunable transmit antenna; and
a base station configured to receive signals transmitted using the tunable transmit antenna and provide a retuning signal indicative of a tuning correction required of the portable radio.

32. The radio communication system of claim 31 wherein the portable radio comprises:
a receiver configured to receive signals from the base station including the retuning signal; and
a controller coupled with the receiver and the tunable transmit antenna, the controller configured to produce a tuning perturbation signal in response to the retuning signal.

33. A radiotelephone comprising:
a receiver;
a transmitter;
at least one tunable antenna;
a controller which responds to configuration data by tuning the tunable antenna to a transmit frequency and which responds to a retuning

signal received from a remote radio to produce a tuning perturbation signal to adjust the tuning of the antenna.

34. A method comprising:

providing a tuning signal to a tunable transmit antenna of a radiotelephone;
tuning the tunable transmit antenna in response to the tuning signal;
detecting a detuning condition; and
providing a correction signal to correct the detuning condition.

35. The method of claim 34 further comprising:

receiving transmitted signals from the radiotelephone at a remote radio;
detecting an error condition in response to the transmitted signals;
transmitting a retuning signal from the remote radio to the radiotelephone;
and
producing the correction signal in response to reception of the retuning signal.

36. The method of claim 35 wherein detecting the error condition comprises:

detecting a received power level for the transmitted signals;
comparing the received power level with a designated transmit power level for the radiotelephone; and
identifying the error condition when the received power level does not match the designated transmit power level.

37. A method for operating a base station in a radio communication system including at least one portable radio, method including:

receiving signals transmitted from a portable radio using a tunable antenna;
detecting an error condition;
in response to the error condition, transmitting to the portable radio a retuning signal to correct the error condition.

38. The method of claim 37 further comprising:
determining a retuning amount required for correction of the error
condition; and
producing the retuning signal indicative of the amount required for
correction.

39. The method of claim 37 further comprising:
receiving subsequent signals from the portable radio; and
transmitting to the portable radio retuning signals until the error condition
is eliminated.

40. A radio comprising:
a transmit antenna tunable to a transmit frequency;
a forward power detector coupled with the transmit antenna;
a receive antenna distinct from the transmit antenna and tunable to a
receive frequency, the receive frequency being a different
independent frequency from the transmit frequency; and
a receive filter coupled with the receive antenna.

41. The radio of claim 40 wherein the transmit antenna, the forward
power detector, the receive antenna and the receive filter are integrated in a
programmable radio frequency front end component.

42. The radio of claim 40 further comprising an antenna control unit
configured to tune the transmit antenna and the receive antenna.

43. The radio of claim 42 wherein the antenna control unit is further
configured to receive a transmit power signal from the forward power detector and
produce a transmit power indication.